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# BIRD-BANDING

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BIRD-BANDING

A JOURNAL OF ORNITHOLOGICAL INVESTIGATION

VOL. VIII JULY, 1937 No. 3

# NESTING HABITS OF THE TREE SPARROW AT CHURCHILL, MANITOBA[1]

By A. MARGUERITE BAUMGARTNER

CHURCHILL, Manitoba, situated at latitude 58° N., halfway up the west coast of Hudson Bay and five miles beyond timberline, proved to be an ideal locality to study the nesting habits of the Eastern Tree Sparrow (*Spizella a. arborea*). Connected by rail with the outside world in 1929, it was perhaps the only spot on the North American continent which could be reached early enough in the season to trace the complete nesting cycle of this species without spending a winter in the North. The town, while far from luxurious, was hospitable, and through the kindness of the United Church missionaries, comfortable living quarters were obtained within half a mile of my nearest nest. The River Flats, a bouldery, hummocky, pool-dotted stretch of tundra extending back to timberline, was interspersed with patches of scrub birch and willow reaching a maximum height of four or five feet, in which Tree Sparrows were one of the most abundant species.

Five months were spent on the nesting grounds—throughout June and July in 1933, and from June 4th to August 21st in 1934. A total of twenty-six nests were found, nine of which were under constant observation from the time of their discovery. While the birds were common, their nests, usually located in the densest tangles of the scrubby thickets, were difficult to find, and attention was therefore concentrated on one small area and on relatively few nests which, however, showed such uniformity that I was satisfied that my observations were both normal and typical of the species.

In 1933 no adults were marked for fear of disturbing their normal activities. Males could be distinguished from females with surprising readiness, for in addition to the singing, they had a more erect bearing, the crown was raised so as to appear almost crested, and their approach to the nest was more direct and free from nervousness. In a concentrated area like that of nests III-VI[2] where territorial problems were studied, individuals could be readily recognized by their songs. Could my return in 1934 have been anticipated, these birds should certainly have been banded to trace their movements the second season, but unfortunately this was not

[1] Presented as a portion of a doctorate thesis at Cornell University in 1935.

[2] This diagram (Map II) was included in the paper "A Comparison of Winter and Summer Territories of the Tree Sparrow," Heydweiller, *Bird-Banding*, Vol. VI, January, 1935, p. 5.

done. In 1934 a few adults were decorated with the gay chicken feathers (see Heydweiller, 1934) to confirm 1933 observations, and the birds were found to pay little attention to the extraneous material.

### TIME OF REPRODUCTIVE CYCLE

According to Taverner and Sutton (1934) the Tree Sparrow spends about four months at Churchill, arriving about May 25th, and were last seen on September 29th. The occasional few of the first two days (Sutton's field notes) were followed almost immediately by enormous numbers including both sexes (none in flocks) scattered through the willows of the river flats. In Alaska, Nelson (1887) likewise noted that flocks were broken when they reached the breeding grounds and that the birds were mated soon after.

Upon my arrival at Churchill on June 5, 1933, birds were already paired and several had begun to build. Selection of territory and mates consequently could not be observed. Table I has been prepared to show the successive phases of the nesting cycle, giving the normal length of time involved in each stage, and the dates inclusive of three typical nests. The proportions of nests were about equally divided between the dates of Nest III and IX, with only two in the Nest I class.

TABLE I

TIME OF REPRODUCTIVE CYCLE OF TREE SPARROW, CHURCHILL, MANITOBA

(Nests—1933, August Data—1934)

| *Activity* | *Dates of Period* | | | *Average Length of Period* |
|---|---|---|---|---|
| | *Nest I* | *Nest III* | *Nest IX* | |
| Building | Completed June 5th | Completed June 13th | | 7 days (Nest II) |
| Rest | 5 days | 2 days | | Several days |
| Laying | June 11th–16th 5 eggs | June 16th–21st 6 eggs | June 25th–28th 4 eggs | 4–6 days, usually daily |
| Incubation | June 16th–28th | June 20th–July 3d | June 27th–July 10th | 12–13 days |
| Hatching | June 28th, 1 at 4 P.M. June 29th, 3 by 7 A.M. | July 3d, 3 by 10 A.M. 2 by 2 P.M. | July 9th, 1 at 9 A.M., 1 at 8 P.M. July 10th, 1 by noon | all within 7–30 hours |
| Young leaving nest | last left July 8th, at noon | July 11th, 3 oldest (disturbed) July 13th, 2 younger | July 18th (only 1 young) | 9–9¾ days (8 if disturbed) |
| Fledglings fed by parents | until first week of August (a few August 19th) | | | about 2 weeks |
| Molt | throughout August (adults and young) | | | about 3 weeks |
| Fall Flocking | first seen August 17th and 19th | | | about a month |

In 1934 the season was almost a week later. The earliest set of eggs was completed on June 19th, and the great majority of the dates corresponded with the IX class.

## DISPLAY AND BREEDING

Song is, of course, the Tree Sparrow's chief means of asserting or displaying himself, since the species is plain colored and sexes are alike. In the breeding maneuvres either sex may be the aggressor, pursuing the other and flaunting its humble beauties. Of a pair which was watched for some time, the pursued bird was finally collected, and proved to be the male. During the building of Nest C the female, approaching the nest with a Ptarmigan feather, was filled with a sudden excitement when her mate came to sing near-by. Dropping the feather, she hopped to a twig about a foot from the ground, spread her wings and fluttered, uttering an alluring *wehy wehy wehy wehy*. The male sang on indifferently; she picked up her feather and went on to the nest.

In another case the female fed quietly on the ground while her suitor sat on a bush above her, and uttered a rapid series of stacatto chips, puffing his plumage, spreading his wings, and darting to the ground with much fluttering. In acknowledgment, she preened daintily, fluttered her wings with neck much extended, and murmured the soft *wehy* notes which brought him to her. Fluttering over her for an instant, he darted back to his perch, repeating the procedure several times in the next two minutes. There was no singing at this time. Sometimes breeding takes place without display of any kind, the male simply flying to his mate while feeding, or at the nest. The pair at Nest I were observed breeding at the nest on three occasions, once during building, twice within half an hour the day before the laying of the second egg.

## THE NEST SITE

In the wet, brushy wastes of the Canadian Northland, from the northern third of the Hudsonian spruce timber as far north as there is any scrubby growth, the Tree Sparrows find the best conditions for nesting and for rearing their young. Within this general habitat the specific sites for the twenty-six nests studied fall into three classes as grouped below:

1. Willow-birch thickets—20 nests in tussocks of grass or depressions in the ground at the base of shaggy bushes, concealed by dry grasses and dead branches.

2. Open tundra, near patch of brush—4 nests in depressions in mossy hummocks, concealed by grasses or semi-prostrate shrubs.

3. Spruces at timberline—1 nest at base of stunted spruce on open tundra; 1 nest five feet up in a small spruce under overhanging branches.

All but one of these were either on or within a few inches of the ground. McFarlane (1891), who examined over two hundred nests in the Anderson River valley, found them mostly on the ground, but occasionally in dwarf willows one to four feet high. The nest last listed above, besides being a fully foot higher than any previous record, was uniquely placed on the remains of an old Redpoll nest.

## THE NEST

*Description.* The nest of the Tree Sparrow is built usually in three layers, an outer shell 20 to 40 mm. thick, composed of heavy grass and weed stems, rootlets, bits of moss, lichens, shreds of bark, and an occasional leaf or twig; an inner coat of fine, dry grass stems, about 10 mm. thick; and finally a soft lining of Ptarmigan feathers. Generally the nests are compact, well-built, and rather heavy, opening to the sky, though a few had their opening at the side. One, located in a deeper depression, lacked almost entirely the outer shell, and was light and loosely woven. The feathers, ranging from 29 to 152 in number, were frequently interwoven into the inner shell. Other materials may be used for linings besides the Ptarmigan's winter dress. Pintail feathers were found in five nests, and exclusively in one. In another, dog hairs were interspersed among the feathers of the lining. One nest contained a soft mass of thin, wiry sporophytes of the mosses that carpet the ground. The presence of a small patch of Lemming fur in the bottom of another suggests that the birds may sometimes raid the old winter nests of this animal that are found everywhere. Shreds of waste cloth were utilized by one enterprising bird built near the railway station.

TABLE II

AVERAGE DIMENSIONS OF TREE SPARROW NESTS
CHURCHILL, MANITOBA

| | *Exterior diam. (top)* | *Interior diam. (top)* | *Interior depth* | *Depth overall* | *Weight* |
|---|---|---|---|---|---|
| Average | 130 mm. | 50 mm. | 35 mm. | 54 mm. | 15.6 gms. |
| Maximum | 150 | 55 | 45 | 70 | 25.9 |
| Minimum | 110 | 40 | 30 | 45 | 4.9 |

*Building.* Nest building with this species was found to be a function of the female alone, but her mate took an active interest in the activities and was never far away. Singing a few feet above her while she worked at the nest, he frisked dutifully after her when she left for another feather or straw, then back to his perch when she returned, or down to the nest to mate with her. The source of the material was never far distant for grasses and moss were the stuff of the tundra itself, and Ptarmigan feathers were scattered everywhere as these birds shed their winter dress. Building was a leisurely process, and after three or four trips for material, the pair flitted off

Nest 1 Male Tree Sparrow Visiting Nest

to feed about the marshy edges of a pool, and the observer might sit and shiver for two hours or the rest of the day before they returned. Nor did they evince any annoyance at intrusions at this time. My visits caused no apparent concern. A Lapland Longspur, also nest-building, once spied a nest, wandered over and helped herself to a feather for her own home.

The construction of a nest (see photograph), under observation almost from the beginning, is briefly outlined below:

June 5th and 6th—Pair seen feeding together; no indications of building though territory defined, as indicated by feeding range and attacks on others of this species.

June 11th—8:30 A.M., nest found, barely started; a small depression in the damp ground. Moss padded partly across the back, bits of straw thinly woven across the front, and two or three soggy bits of dry grass on the floor. Female came to nest three times in two hours.

3:00 P.M., floor sparsely laid with soggy straws from the front to one-third of way back.

June 12th, 7:30 A.M.—Nest much more rounded and built up in front. Yesterday's flooring covered with bits of moss and peaty sod.

7:30 P.M.—Rim built up an inch above yesterday's mark, broader, measuring now one-quarter inch thick, in back as well as front of nest. Floor well padded with moss and sod. Length of time for outer shell approximately three days.

June 13th, 3:00 P.M.—Nest has a beautifully-woven inner coat of fine dead grass, stems, and one Ptarmigan feather. Inner coat practically completed in one-half day.

June 14th, 6:15 P.M.—three feathers in nest.

June 15th, 7 P.M.—ten feathers more and finer grasses added to inner shell, burying one feather.

June 16th, 10:30 A.M.—one new feather.

June 17th, 18th, and 19th—no change, nest looks complete.

June 21st, 12:30 P.M.—one egg.

Lining completed in three days, followed by rest of five days. Upon examination of this nest at the end of the season 43 feathers were counted.

The material carried to the nest does not apparently follow a rigid sequence, nor does building always cease before laying begins, as noted above. At Nest B, which on June 21st contained one egg on a sparse lining of feathers, the female brought in a bill-full of grasses, which she scattered over the floor of the nest. At Nest III the addition of brown Ptarmigan feathers was noted overlying the white of the original lining after the young were well grown.

*Defense.* The chief defense of the territory against invasion is song, strengthened by an occasional brisk assault upon an intruder.

While this is the work chiefly of the male, his mate occasionally assumes the offensive. At Nest I when young were a day old, the brooding female suddenly darted from the nest and made a vicious attack upon another Tree Sparrow. At Nest IV an incubating female flew at a Yellow Warbler which had carelessly perched 15–20 feet from her. Her mate was singing only 150 feet from the nest, but she apparently considered the case too urgent to wait for him to expel the trespasser.

At human intrusion the parent birds chipped anxiously, but neither attacked, as will Terns, Owls, Jays, etc., nor did they feign lameness like their neighbors the shore birds, though if followed they would guilefully lead one farther and farther afield. The chief defense of the incubating female was her streaky coloration, upon which she relied until almost stepped upon.

## THE EGGS

*Description.* In color, size, and shape of the Churchill eggs a striking variation was noted not only in the different nests but within a single set. The ground color ranged from pale blue to greenish, and from a clear, almost bright hue to a dull, leaden appearance. In some the brown fleckings were so evenly washed over the whole surface that the ground color was almost obliterated, though generally they were more concentrated at the large end of the egg. The shape has been described as oval, ovate, or ovoidal. Frequently one egg in a nest was conspicuously more rounded than the others.

TABLE III

WEIGHTS AND MEASUREMENTS FROM FORTY EGGS OF EIGHT NESTS OF TREE SPARROWS AT CHURCHILL, MANITOBA

| | *Length* | *Width* | *Circumference* | *Weight* |
|---|---|---|---|---|
| Average | 19.1 mm. | 14.2 mm. | 44.0 mm. | 2.12 gm. |
| Maximum | 21.0 | 15.5 | 48.0 | 2.40 |
| Minimum | 17.5 | 14.0 | 41.0 | 1.82 |
| Variation in 1 set (Nest VI) | 21.0 | 14.5 | long and oval | 2.40 |
| | 19.5 | 14.0 | normal shape | 2.08 |

The average egg weight equals 11.37 per cent of the yearly average weight of the female bird (18.62 gm.). The above egg weights were taken during early incubation. At Nest I weights were taken at intervals of three or four days to check the per cent of loss. Average figures obtained are as follows:

TABLE IV

LOSS IN EGG WEIGHT DURING INCUBATION

| | | | |
|---|---|---|---|
| Weight at 4 days | 2.05 gm. | Weight of newly-hatched young | 1.62 gm. |
| Weight at 8 days | 1.88 gm. | | |
| Weight at 12 days | 1.75 gm. | Weight of shell (from sets collected and blown) | 0.162 gm. |
| Total loss | 0.30 gm. | | |

Per cent of loss—14.63 per cent

*Number.* A normal clutch of the Tree Sparrow at Churchill ranged from four to six eggs, the majority consisting of five. McFarlane's records (1891) for 216 nests was four to five, with occasional sets of six or seven. Sets of two and three are apt to be incomplete. It is interesting to speculate on the comparatively large proportion of four-egg sets in 1934, which may possibly be correlated with the retarded season. Further evidence for this theory is suggested by the fact that the latest nest in 1933 contained only four eggs, one of which, moreover, was infertile. Sets recorded by Dr. Sutton in 1931 (field notes), and my own for two seasons, rank as follows:

TABLE V

SIZE OF CLUTCHES IN THREE SEASONS AT CHURCHILL, MANITOBA

| | *4 eggs* | *5 eggs* | *6 eggs* |
|---|---|---|---|
| 1931 | 2 sets | 8 sets | 2 sets |
| 1933 | 1 " | 10 " | 1 " |
| 1934 | 6 " | 5 " | 1 (3 infertile eggs) |

In order to determine the capacity for laying of this species, the third egg at Nest II was removed each morning. Unlike the famous Flicker which laid 71 eggs, the female settled down on her fifth egg and would toil no more. The experiment was not repeated, and may represent only an individual case.

*Fertility.* Of 66 eggs in 14 nests which were watched through an undisturbed hatching, 5 eggs or seven per cent never hatched and were presumably infertile. Of these 3 belonged to the 6-egg set, 1 to a belated 4-egg set, the other to a normal set of 5 whose complete history could not be traced.

*Casualties.* Several other natural causes affected the population of the Tree Sparrow tribe:

Nests A and C were found unoccupied with both adults gone, and in one case two of its five eggs had completely disappeared, cause unknown, but probably was either from desertion or the destruction of the birds.

At Nest IX the third (and last) young bird hatched twenty-four hours after the first, and died during the first day. This suggests that it could not maintain itself against its larger brothers, and consequently starved. At Nest III the last of six eggs was noticeably pipped when I left for a week's absence. Upon my return only five young were found, and the guess is hazarded that the fate of this nestling was the same as that of the Nest IX bird.

Summarizing the pre-nestling mortality, then, of a total of 75 potential eggs, 16, or 21.33 per cent never lived beyond the day of hatching.

*Number of Broods.* Due to the briefness of the northern summer, only one brood can be reared in a season. While it is possible that

an observer might miss an occasional case, a study of the table of dates and times required for each phase of the cycle shows the unlikelihood of a second nesting. Since the earliest known young left the nest on July 8th and had to be fed for two or more weeks by both parents, activities for a second brood could not be commenced until at least July 22d. The 70 days required to bring those young through the post-juvenal molt would make the date at the earliest September 28th, one day before the last date the species was seen in the region. There would be no time for recuperation from the molt or for fall flocking. This calculation is based on minimum figures, so that it is extremely improbable that a second brood of Tree Sparrows is often if ever reared in this region.

*Laying.* After the nest was completed there was usually a rest of several days, during which the birds seldom visited the nest. Thereafter an egg was laid daily. Of five nests observed only one bird skipped a day (between the second and third eggs). It is interesting to note that in two sets where the eggs were marked in order of laying the second was noticeably smaller.

The eggs were laid in the early morning, between 6:00 and 7:30 A.M. At Nest I the second egg had not been deposited at 6:45, but was laid before I returned at 7:45. On the fourth day the new egg was in the nest when I arrived at 6:30.

During egg-laying somewhat more interest was evinced in the nest. Of ten visits to Nest I during this time, the female was found covering the eggs on two occasions, once from 5:30 to 6:00 A.M., returning at 6:25 to lay, and once in mid afternoon. In addition the male visited her twice, and came once when she was absent. Other females were found on their nests at various hours of the day. When Nest B contained one egg, the bird was flushed at noon, returning in about fifteen minutes with a bill full of grasses. From the scanty evidence of two nests, it is believed that the female roosted there at this time, as Nest II (with four eggs) was occupied at 10:15 P.M., and one (with one egg) at 5:30 A.M.

## INCUBATION

*Time.* Incubation, performed by the female only, begins normally with the laying of the last egg, though, as just indicated, she visits the nest occasionally during laying, and probably spends every night there. At Nests III and IX another egg was laid after incubation had apparently commenced. It may be significant that at both nests one egg hatched much later than the others, and this last young died before its first day was over.

During the first days, the female at Nest I was absent frequently for long periods, and on the morning of June 18th, two days after the set had been completed, the eggs felt ominously cold. Twenty minutes later I found her incubating persistently, and thereafter

she was seldom long absent. About two-thirds of the working day she spent on duty, a ratio which she maintained throughout the period. While the per cent of time did not vary appreciably, it was noted that during late incubation the periods on and off the nest were of much shorter duration. These facts are indicated by the following figures, compiled from three- and two- hour observations respectively at mid and late incubation. Interestingly enough the maximum period away from the nest occurred during a brief cold shower.

TABLE VI
INCUBATION PERIODS OF THE TREE SPARROW

| | *6 days' incubation* | *11 days' incubation* |
|---|---|---|
| Time on nest | 61.80 per cent | 61.78 per cent |
| Time off nest | 38.20 per cent | 38.22 per cent |
| Av. length of period on nest | 21.6 (max. 31) | 7.6 (max. 34) |
| Av. length of period off nest | 14.0 (max. 33) | 5.2 (max. 12) |

*Position on Nest.* During incubation the female crouched low in the nest, with neck drawn in, wings laid compactly against and back and tips of primaries crossed over the rump, only the bill and tail extending beyond the rim of the nest. This position was conspicuously different from the brooding posture, when she sat high over the nest, frequently panting from heat, neck outstretched, wings drooping over the rim of the nest. At Nest VII, after one young had hatched, the parent alternated these positions at frequent intervals.

*Activities of Male.* During this period the male continued to show a direct interest in home and mate, visiting the nest frequently. At Nest III he appeared three times during two hours, and the pair flitted away together to feed. During the night males of four nests were flushed from twenty to sixty feet from their nests. From the ground or the base of the bushes they scudded low a few feet ahead of me, silently or with a low tsip. One sang a few bars of song and trailed off to silence in the middle of a note.

After an incubation period of from 12–13 days the young emerged, scrawny and naked and eternally hungry. The development of the young will be the subject of a succeeding paper.

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# A PROBLEM AND A PLAN RELATIVE TO THE STUDY OF BIRD DISEASES

By C. BROOKE WORTH, M.D.

AT a recent meeting of the Eastern Bird-Banding Association, the members agreed unanimously that the present winter (1936–1937) has been marked by an unprecedented scarcity of birds, notably the smaller species which usually are the mainstay of winter banding work. It was felt that this scarcity could not be attributed solely to the mildness of the weather, for the birds were not only absent in the vicinity of houses, but were also rare along their normal feeding ranges in old fields and in sheltered valleys.

It was reported by one of the members that the nation-wide Christmas Census of the Audubon Societies, reported in "Bird-Lore," disclosed an almost universal scarcity of individuals, although the number of species of birds seen was about normal.

On the basis of these reports the members began to suspect that this winter might be marking the low ebb or depression following a populational peak, according to the phenomona of ecological cycles, well-known among several of the larger animals and birds. It was felt, however, that the evidence, while suggestive, was at the same time too meagre to base valid conclusions upon, and the desirability for some sort of confirmatory study became evident at once.

The nature of such a study, it was felt, should be based upon known ecological facts. They were briefly reviewed under the following headings:

1. The Hudson Bay Company's data showing periodic fluctuations in the populations of fur-bearing animals.
2. The type of populational curve:
    a. Building up to a peak over a period of years, and followed by a sharp decline to the lowest ebb—the latter within one or at most two seasons;
    b. Peaks of curves occurring at regular intervals over many years of observation and tabulation.
3. Relationship of ecological periodicity to the sun-spot cycle:
    a. Coinciding among larger animals;
    b. Failing to coincide among smaller animals, which in general have a shorter periodicity.
4. Food-chains in relation to populations.
5. Normal index of reproductivity among various links in the food-chains.
6. Disease among animal populations:
    a. During low ebb;
    b. During "normal" concentrations;
    c. During overcrowded "peak" conditions.

This ecological information, which constitutes a very recently recognized branch of investigation in the field of natural history, is still in a nebulous state for the following reasons: (a) it can not

yet be applied generally to all biological situations, for its conclusions are based largely on the study of a limited group of animals, principally the larger game animals; and (b) there is scarcely any information on this subject in the province of the smaller birds.

Such indications as there are, however, point to epidemic diseases as the factor, causative in sweeping through the ranks of a populational peak and reducing a species to a scattered few survivors. Whether the diseases have a "cycle" too, or whether the periodicity of the diseases is a function secondarily of the overcrowding of the species consequent upon reaching a peak—the disease then flourishing because of the increased facility for its transmission—is also unknown.

The disease itself, however, if it exists, must be a most significant point in the cycle of any species of animal, and a knowledge of this disease would be an important adjunct to our understanding not only of the species in question but also of the life histories and evolutionary sequences of all forms of life.

The Eastern Bird Banding Association therefore agreed that it would be instructive to make a study of bird diseases at the present time, when evidence of the assumed recent epidemic might still be at hand. It was proposed that a nation-wide survey of bird diseases be inaugurated, and that the information so obtained be disseminated through the medium of *Bird-Banding* under the direction of a competent guiding hand.

In discussing possible methods of carrying on such a study, the members recognized many obstacles to the success of the project, and since that time these obstacles have been multiplied. Incidentally the most crucial of these has been the difficulty in being sure that the present period *does* represent a populational depression. Dr. Austin reports a normal concentration of birds at his banding station in Massachusetts, and a Delaware County, Pennsylvania, game warden states that small birds have been abnormally abundant in woods and fields this winter in sharp contrast to their scarcity near human dwellings.

Recognizing, however, that the majority of banders have observed a bird-depression, can one then justifiably assume that an epidemic has been at the root of it? The cycles of periodicity in numbers of larger animals sometimes show a relationship to one another, in such a way that the cycles of various species either coincide or follow one another at definite intervals according to their respective positions in the food chain. Does it seem plausible that almost all of the smaller species of birds should have coinciding cycles? Or does this very coincidence point to some recent and abnormal catastrophe which has affected all species indiscriminately of their usual ecological trends?

These questions, again, cannot be answered at present; indeed by their very unanswerability they make the proposed study more urgently needed. This may be said as a hypothesis: that the present populational situation has been discerned principally among so-called "winter-birds," whether migratory or not, and these "winter-birds" are fundamentally graminivorous. Hence, the first link in the food-chains in which they occur is identical among them, and therefore it is possible that the subsequent links—and the even more remote cycle-phenomona—may also coincide.

But, to return to the actual disease-survey, how can the nature of the epidemic be studied? Bird banders cannot slaughter the birds they trap, in search of internal disease. The only source of information must be the bodies of birds found dead, or birds which die at a banding station. Here is, perhaps, the greatest obstacle to the study, namely, that one finds so few dead birds during, let us say, the course of a year.

For this and other reasons, it seemed wisest to conduct the study from some sort of central bureau, dividing the territory first into a few sub-regions, and maintaining the bureau as a final agency for the correlation and analysis of all the gathered information. In each sub-region (such as Boston, New York, Philadelphia, and Washington) an effort would be made to secure the interest and coöperation of a competent pathologist, and all the banders of the region would ship dead birds to him as soon after obtaining them as possible, preferrably under conditions of refrigeration.

And here, it seems, the chief objections to the project have arisen from some of those to whom it has thus far been submitted for consideration. Those who have made occasional post-mortem examinations of birds all agree that the processes of decomposition take place with surprising rapidity in the carcases of these creatures, and for this reason one pathologist has already condemned this study as impractical and destined to certain failure.

It is quite possible, without advocating beyond the point of reason the desirability of undertaking such an investigation, to take issue with these pessimistic opinions. To do so, one must define the term "valuable dead bird." The dissenting pathologists brand the dead bird as valueless as soon as post mortem decay has been in progress for a few hours. At this time the blood parasites can no longer be recovered for microscopic study, and many of the viscera have deteriorated beyond even the possibility of recognizing them. Furthermore, they say, most dead birds are found to have died following an accident of some sort, rather than from any "natural cause" such as the diseases which it is hoped to study.

The value of a dead bird, from the standpoint of the ecological information it may impart to us, extends beyond such narrow limits, however. Following early decomposition, much significant

data is truly lost, but there is still something left. Many intestinal parasites remain, perhaps in a dormant state, but susceptible to observation and classification. There may be a few lingering ticks and lice—at least a search should be made for them. And—most significant of all—the skeleton and plumage remain exactly as they were in life, and years of deterioration in the soft parts will not erase the story which may be written in the durable remnants of a bird—possibly a sick bird.

The effects of diseases of all kinds (e.g., dietary, bacterial, etc.) on the human skin and skeleton are very well recognized. We at least *know of* a disease among the smaller species of sparrows which affects the bills and feet of the birds, producing strikingly recognizable defects. Is it not worthy of investigation, to see how generally such deformities can be found, and how they may have contributed to the deaths of birds? What other uniform changes in skeleton, feathers, feet, and bill are produced by other diseases?

Again these questions are asked in a field of pure speculation. For the answer may be that there are no such changes. But inasmuch as a series of dead birds has never been assembled for critical examination from this standpoint, it is not possible to say definitely that such changes do not occur; and if it were discovered that they *do* occur, an entirely new basis for the study of the pathology of wild birds might be established.

It might be proven, moreover, that there are certain basic deficiencies and diseases which predispose birds to the destructive invasions of blood and pulmonary diseases. The malarias and pneumonias, whose traces are lost during early decomposition, may be only the secondary agents in causing death; in other words the birds may be so weakened by some basic primary disturbance that almost any slight superimposed infection would be sufficient to turn the tide to decline and death. These secondary infections may be harbored quite innocuously during normal periods of health.

Finally, as to the scarcity of birds found dead from "natural" causes, it has by no means been proven that the birds which annually are killed in large numbers by hunters, automobiles, lighthouses, oil-pollution at sea, and so forth, are perfectly healthy birds. Even as secondary infections may single out birds already weakened by serious disease, so these mishaps may occur among individuals whose normal cautiousness and vigilance has been lessened by disease. It would be well, therefore, to suspect all catastrophic deaths of having an element of "natural cause" in them until it is fully proved that they have not.

The foregoing dissertation wholesomely disperses our aim, which at first was directed wholly at a hypothetical epidemic. We now seek the background upon which that epidemic can operate. If we can become oriented in this wider arena, we should be able to understand the consequences, such as epidemics, with greater ease.

Having enlarged the scope of study and source of materials for that study to this point, it needs only to be emphasized that bird banders themselves constitute so small a fraction of people who might find dead birds that this final weak point should be strengthened. It might be possible to interest the Game Commission in each state in our problem. If these bodies could be persuaded to instruct all their field agents to send dead birds to the designated regional pathologist, a far greater number of birds could be obtained for examination. Furthermore it is well known that many of our protected birds, found dead, are taken to taxidermists for mounting, but are relinquished there when it is discovered that a fee for possession of these species is required by the law. Therefore if each bander could coöperate with the taxidermists in his locality, many more specimens could be obtained for pathological study. It might also be possible to interest the Coast Guard, the Audubon Societies, and to spread the information to the public through local newspapers.

In conclusion, therefore, the Eastern Bird-Banding Association:

1. Recognizes the necessity for certain ecological studies among our smaller species of birds;
2. Recognizes the difficulties to be encountered in such studies;
3. Presents a plan for carrying out such studies in the face of the difficulties;
4. Suggests some of the possible valuable trends which such studies might pursue.

We hope that all bird banders will coöperate with us in suggesting further means of accomplishing this task. But let these banders not forget that the results of such work may be very slim in comparison to the time expended upon it. The field is practically unknown, and the discovery of even one small fact should be sufficient reward for the true pioneer.

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# THE WINTERING OF A NORTHERN FLICKER IN CENTRAL IOWA

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THE Northern Flicker (*Colaptes auratus luteus*), well known as a summer resident in the northern states, also occurs there in winter more or less regularly. The A.O.U. Checklist (1931) gives the breeding range of this bird as follows: " . . . from Canada east of the Rocky Mountains and north to the limit of trees in Alaska and throughout the northern and central United States south to the northern edge of the lower Austral Zone," and continues by stating that the bird is, " . . . more or less regularly resident except in the extreme northern parts of its range." For Iowa, DuMont (1934), summarizing the observations of several coöperators with his own, speaks of the flicker as uncommon in winter.

At Ames, Iowa, Errington (1936) found several flickers that attempted to winter over in 1935–'36, unsuccessfully, and he was intrigued to try to account for their behavior in feeding habits. The Flickers that he observed quite habitually utilized the source of food that was nearest at hand. Errington's observations seemed to indicate that the birds filled up on the material nearest at hand, often to the exclusion of corn in a field which was farther away, but probably more nutritious. Some of the Flickers died with their crops quite well-filled with sumac (*Rhus glabra*) seeds, and the fecal analysis showed a perdominance of sumac over all other foods utilized; only about 1.8 per cent of the droppings indicated insect food.

The findings of Errington stimulated the writers to be on the watch for wintering Flickers close at hand in late 1936. Not one was seen apparently settled in a territory until late in January, 1937, when the senior author came across a male Flicker that spent most of its time during the winter in and around a 40-acre tract of timber, a permanent preserve of virgin forest and a part of the Campus of Iowa State College. He spent the night, at least, during the more severe weather in the hollow of a dead hickory tree (*Carya glabra*), standing near the center of the northwest quarter of the forest. The preserve, rolling in topography and supporting several ecological plant formations, furnished a variety of winter plant food. Furthermore, dead trees left in the area held an increased insect population that might be used as food by birds. Supplementing these natural food-supplies were a considerable number of apples hanging in an old orchard about 100 yards north of the wooded area, and the fruits of a small planting of cultivated trees bordering the north side of the timber. East of the timbered area lay an un-

harvested cornfield from which the squirrels carried numerous ears of corn into the woods during the winter.

At Ames the first severe weather of the winter of 1936–'37 came in the first 10 days of December when the temperature fell as low as −7°F. and was accompanied by some snow. The remainder of the month averaged near freezing temperature with about one inch of precipitation mostly in the form of rain during the last seven days of the month. January temperatures, with a low of −11° F., and a high of 36° F., averaged 5° F. below the 65 year average. During the month 1.97 inches of precipitation in the form of sleet fell during the first few days, and snow later. Early February was quite severe with a low of −16° F. on the 10th, whereas the last 10 days were mild. Precipitation and the average temperature were about normal for the month. The temperature during the period, December 1, 1936 to March 1, 1937, averaged 20.4° F., which was 1.1° F. below the 65 year average of those months for the State. This was somewhat warmer than the record breaking low of the preceding winter with the coldest February in 117 years. These weather data were obtained from the United States Weather Bureau (1936, 1937).

At the first observation, in late January, a considerable quantity of fecal material was seen in the bottom of the hollow in the tree, but none of it was collected until February 15th, when all of the droppings were removed. During the relatively mild weather of late February the Flicker did not always use the tree at night; consequently only a small amount of feces were found after the first collection. One collection consisting of a half-dozen droppings was made on February 24th, and another of only two droppings on March 1st. The bird was not known to have used the night tree after March 1st, but, as the severe weather was already past, it may be safely stated that this Flicker wintered successfully.

Analysis of the feces showed that this Flicker took quite a wide variety of foods. Somewhat over half of the total of 77.8 cc. of feces examined was so thoroughly digested that it could not be identified. Of the remainder, 23 per cent consisted of animal material and 77 per cent of plant material. The animal material contained ants' remains made up of exoskeletons of 90 carpenter ants (*Camponotus herculeanus pennsylvanicus*) with two individuals of another species, and skeletal remains of two lepidopterous larvae, four small Coleoptera (unidentified), one darkling beetle (*Tenebrio* sp.), three squash bugs (*Anasa tristis*), and one Arachnid. The plant material was made up of greenbrier (*Smilax rotundifolia*), 181 seeds, in quantity 4.8 cc., or 16.7 per cent of all recognizable materials, and pulp associated with the seeds, 8.2 cc. or 28.5 per cent; poison ivy (*Rhus toxicodendron*), 150 seeds, 3.6 cc., or 12.6 per cent; apple pulp 3 cc. or 10.1 per cent; Virginia creeper (*Psedera* sp.)

seeds and seed shells, 2.0 cc., or 6.9 per cent; grape (*Vitis* sp.) seeds and seed shells, 0.6 cc. or 2.2 per cent; and corn a small amount represented by a few hulls.

The above figures do not necessarily indicate how much of each item the bird ate, because the proportion of the amount ingested to the amount passed in the feces would vary from one food to the next. For example the figure for insect material is probably low in comparison with the amount actually taken because insects would probably be more thoroughly digested by a Flicker than would most plant material.

A comparison of relative abundances and proximities of the various foods actually eaten by the Flicker with those possible sources of food not utilized show that the bird did not always consume in largest amounts the food that appeared to us to be closest at hand, nor that was most abundant. Although no attempts were made to determine the abundance of the insect forms in the preserve, in an area of this kind with numerous dead trees and decaying logs it might reasonably be expected that such forms as those found in the feces would be quite abundant, for they are insects that hibernate just under the bark, in rubbish and in punky logs. The insect remains in the feces were invariably found in a mass not mixed with the vegetable material, and consisted of all parts of the insects' exoskeleton and not just the spiny parts. As McAtee (1935) pointed out that it is physically impossible for insect remains to become lodged for any length of time in a bird's stomach, it was assumed the insects were taken during the period when the flicker roosted in this tree. Perhaps the bird obtained the bulk of its insect food during the third week in December, for then ants were observed by the senior author to be active, though somewhat sluggish. The insects hibernating in rubbish or in logs on the ground would probably not be available after the early January snow and sleet storms until the February thaws about the middle of the month. Any insects that hibernated under the bark or in upright trees would be more or less accessible at any time during the winter.

Of all the plant foods that Flickers have been known to eat, the one in this area that was nearest to the night tree and still of reasonable abundance was a thicket of sumac (*Rhus glabra*) covering about 1.5 by 3 rods in area at a distance of 100 yards. The sumac bore numerous fruits estimated at 130 clusters which were still on the bushes during the spring months. It will be noted from the analysis data that sumac was lacking. The plant foods of which this bird made the most use were greenbrier and poison ivy. There were six sizable clumps of greenbrier at distances of 160 or more yards from the night roost, and a patch of poison ivy 0.5 by 6 rods, with approximately 300 clusters of fruit, at a distance of 200 yards from the same point. Neither of these was as close to the night

roost as the sumac that was not utilized at all. Furthermore, to get to the poison ivy required a flight of at least a few yards in the open and feeding in relatively unprotected territory. This was not the case with the planting of cultivated trees bordering on the north of the native timber area. These trees, at a flight distance from the night tree about equal with that to the poison ivy, were directly adjacent to the woods and formed relatively good cover. This planting was made up of 14 buckthorns (*Rhamnus* sp.) bearing very numerous fruits, and 16 junipers (*Juniperus* sp.) which bore a few fruits throughout the winter. Apparently neither of these possible food sources was utilized.

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# RESULTS OF 1936 BIRD BANDING OPERATIONS AT AVERY ISLAND, LOUISIANA, WITH SPECIAL REFERENCES TO SEX RATIOS AND HYBRIDS

By E. A. McILHENNY

WHEN a large number of birds of any species are banded at one station, and such banding continued for many years, interesting features in the life history of the birds are discovered which could not be determined in any other manner, one of the most interesting of which is the sex-ratio.

During the more than twenty-five years I have been banding migratory wild-fowl and non-game birds at Avery Island, Louisiana, my records show that the yearly proportion of males to females taken in my traps has remained about the same, and there has been little variation from year to year of this proportion.

Reviewing my banding records for the year 1936, during which year I banded 17,991 migratory birds, 9,908 of which were wild-

fowl. I banded 961 male Ring-necked Ducks (*Nyroca collaris*), and only 286 females, or more than three times as many males as females.

Of American Pintails (*Dafila acuta tzitzihoa*), 2,780 were males, and 1,413 were females—just about two males to one female.

Of Lesser Scaup Ducks (*Nyroca affinis*), 280 males and 174 females were banded, or one and six-tenths males for each female.

Of Blue-winged Teal (*Querquedula Niscors*), I banded 1,318 males and 752 females—a ratio of almost two males to one female.

Of Wood Ducks (*Aix sponsa*), 145 males and 66 females were banded. Here the ratio is little more than two males to one female.

Such a predominance of males is undoubtedly a major factor in the decrease of our ducks, and may have been the governing factor in the extermination of the Labrador Duck (*Camptorhynchus labradorius*), as the known specimens of this species in our museums are almost all males.

In many of our non-game birds the sex ratio varies as greatly as in the wild fowl. I find in 1936 that I banded 968 male Red-wings (*Agelaius*) and only 239 females—a little more than four males for each female.

Of Cowbirds (*Molothrus ater ater*) banded, 1,902 were males and 769 were females, or almost two and a half males for each female.

There has been one exception to the rule, for out of 1,189 Boat-tailed Grackles (*Cassidix mexicanus*) banded, 419 were males and 770 females, or one and eight-tenths females for each male. This is the only species in which I have found the females outnumbering the males.

In banding a great number of birds of one species, many interesting plumage variations will be noted. I frequently get birds showing partial albinism and many that are much darker than the type. Partial albinism is of frequent occurrence in the Red-wings and Cowbirds, and not uncommon in the ducks.

On November 20th, a fine, full-plumaged albino Pintail male, and a full-plumaged partly albino Ring-neck male were captured, both of which I sent to the United States Biological Survey.

## HYBRIDS

On February 8th, I captured and placed band 36-612319 on a very well-marked hybrid of the Coot (*Fulica a. americana*) and the Florida Gallinula (*Gallinula chloropus cachinnans*). This bird had the red beak of the Florida Gallinule with the white shield above the beak as in the Coot. The eyes were colored as in the Florida Gallinule. The legs were like those of the Florida Gallinule even to the color and the red bare space above the knee joint. The feet were semi-palmated like the Coot's and the entire body coloring and general body build were like that of the Coot, except the plum-

age of the back which had the coloring of the Florida Gallinule. The bird was much smaller than an adult Coot.

On December 26th, I placed band 37-702072 on a well-marked male hybrid between Canvasback Duck (*Nyroca Valisineria*) and a Redhead (*Nyroca americana*). The shape of the head of this bird was less round than that of a Redhead, but was not so sloping as that of a Canvasback. The shape and color of the beak were characteristic of the Redhead even to the band across it. The color of the plumage on the back was like that of the Canvas back, but the neck, breast and tail as well as the legs were like those of the Redhead. The colors of the wings were intermediate between the two species.

On December 19th, I placed band 36-689594 on a hybrid Lesser Scaup Duck—Ring-necked Duck, and on December 31, 1936, band 36-690095 was placed on a second hybrid of these two species. Both of these birds had the banded Ring-necked beak with the Lesser Scaup's head and eye coloration. The plumage of the neck and back was modified Lesser Scaup's plumage, showing considerable white in this plumage, while the feet, tail, and breast plumage was that of the Ring-necked Duck.

By far the commonest hybrid is Mallard (*Anas platyrhynchos*) —Pintail, although I have quite often had Mallard—Gadwalls (*Chaulelasmus streperus*) hybrids and Pintail—Gadwall hybrids.[1]

One of the most unusual hybrids taken was a cross of a Black Vulture (*Coragyps a. atratus*) and Turkey Vulture (*Cathartes aura septentrionalis*). This bird was captured in the winter of 1937 in my Vulture trap, and was such a perfect, well-marked specimen that I sent it to the United States Biological Survey alive, and it is now in the flying cage of the Rock Creek Zoo at Washington, D. C.

Unusual climatic or water conditions often result in the capture of unusual species. For instance, due to low water around one of my duck banding traps, I was enabled to catch and band a number of shore birds in rather an interesting way: During August, the water in my big duck ponds was very low, in fact, only about two or three inches deep around the banding traps, and for a good many hundred feet in front of the traps. The man in charge of my wild life refuge reported great numbers of Black-necked Stilts (*Himantopus mexicanus*) and other waders in the ponds. On Friday, August 14th, I went to investigate, and found the Stilts feeding right in front of one of my large duck-banding traps. On walking slowly around them, two of them went into the trap's "V," and I succeeded in catching them. As a great many Stilts were near the trap, I conceived the idea of a Stilt drive, so on Saturday, August 15th, in the afternoon, I took four men with me, and we walked

[1] It is much to be regretted that these duck hybrids were not collected, thus permitting their study by others.—EDITOR.

through the shallow water towards the trap in the form of a bow, moving very slowly and driving the Stilts before us towards the wire "V" leading into the trap. We made two drives—one in the early afternoon, and one in the late afternoon. The result was that on the first drive, we got eighteen Stilts, and on the second drive we got nine more, two Pectoral Sandpipers (*Pisobia melanota*), and one Lesser Yellow Leg (*Totanus flavipes*), all of which I banded.

The traps I use for taking non-game birds are modified crow traps—large wire enclosures with a "V" opening downward from the top. During the past fall one of these traps in which I took large numbers of Cowbirds and Red-wings was visited daily by a male Cooper's Hawk, who each day for nine days returned to the trap, entered through the top, and gorged himself on the smaller birds the trap contained.

Interesting features of this year's banding operations are too numerous to mention. It is of interest, however, to note that Eastern Mockingbirds (*Mimus p. polyglottos*) during the period of from September 6th to October 17th showed a very marked migration. One non-game bird trap stands near a group of small hackberry trees on an open prairie at least a quarter of a mile from any other trees. In this trap, although baited with rice, I took almost daily three or four Mockingbirds, most of them juveniles; showing, I believe, that these birds were migrating in family units.

The following tabulation lists all species banded during the year and also the number of each. The totals of ducks and a few other species are listed by sexes:

| | |
|---|---|
| Pied-billed Grebe (*Podilymbus podiceps podiceps*) | 5 |
| Louisiana Heron (*Hydranassa tricolor ruficollis*) | 1 |
| Lesser Snow Goose (*Chen hyperborea hyperborea*) | 3 |
| Blue Goose (*Chen caerulescens*) | 44 |
| Fulvous Tree-Duck (*Dendrocygna bicolor helva*) | 7 |
| Mallard (Drake) (*Anas p. platyrhynchos*) | 129 |
| Mallard (Hen) (*Anas p. platyrhynchos*) | 123 |
| Common Northern Black Duck (Drake) (*Anas rubripes tristis*) | 2 |
| Mottled Duck (Drake) (*Anas fulvigula maculosa*) | 28 |
| Mottled Duck (Hen) (*Anas fulvigula maculosa*) | 16 |
| Gadwall (Drake) (*Chaulelasmus streperus*) | 6 |
| Gadwall (Hen) (*Chaulelasmus streperus*) | 3 |
| Baldpate (Drake) (*Mareca americana*) | 1 |
| Baldpate (Hen) (*Mareca americana*) | 1 |
| American Pintail (Drake) (*Dafila acuta tzitzihoa*) | 2,780 |
| American Pintail (Hen) (*Dafila acuta tzitzihoa*) | 1,413 |
| Green-Winged Teal (Drake) (*Nettion carolinense*) | 39 |
| Green-Winged Teal (Hen) (*Nettion carolinense*) | 29 |
| Blue-Winged Teal (Drake) (*Querquedula discors*) | 1,318 |
| Blue-Winged Teal (Hen) (*Querquedula discors*) | 752 |
| Shoveller (Drake) (*Spatula clypeata*) | 11 |
| Shoveller (Hen) (*Spatula clypeata*) | 1 |
| Wood Duck (Drake) (*Aix Sponsa*) | 145 |
| Wood Duck (Hen) (*Aix Sponsa*) | 66 |
| Redhead (Drake) (*Nyroca Americana*) | 17 |
| Redhead (Hen) (*Nyroca Americana*) | 19 |

| | |
|---|---|
| Ring-necked Duck (Drake) (*Nyroca collaris*) | 961 |
| Ring-necked Duck (Hen) (*Nyroca collaris*) | 286 |
| Canvas-back (Drake) (*Nyroca Valisineria*) | 12 |
| Canvas-back (Hen) (*Nyroca Valisineria*) | 8 |
| Greater Scaup Duck (Drake) (*Nyroca marila*) | 2 |
| Lesser Scaup Duck (Drake) (*Nyroca affinis*) | 280 |
| Lesser Scaup Duck (Hen) (*Nyroca affinis*) | 174 |
| Buffle-Head (Drake) (*Charitonetta albeola*) | 1 |
| Ruddy Duck (Drake) (*Erismatura jamaicensis rubida*) | 3 |
| Ruddy Duck (Hen) (*Erismatura jamaicensis rubida*) | 5 |
| Hooded Merganser (Drake) (*Lophodytes cucullatus*) | 6 |
| Black Vulture (*Coragyps a. atratus*) | 2,010 |
| Sharp-Shinned Hawk (Male) (*Accipiter v. velox*) | 1 |
| Cooper's Hawk (Male) (*Accipiter cooperi*) | 2 |
| Cooper's Hawk (Female) (*Accipiter cooperi*) | 1 |
| Eastern Sparrow Hawk (*Flaco s. sparverius*) | 1 |
| Eastern Bob-white (*Colinus v. virginianus*) | 77 |
| Virginia Rail (*Rallus l. limicola*) | 1 |
| Florida Gallinule (*Gallinula chloropus cachinnans*) | 205 |
| American Coot (*Fulica americana americana*) | 833 |
| Killdeer (*Oxyechus v. vociferus*) | 5 |
| Lesser Yellow-legs (*Totanus flavipes*) | 1 |
| Pectoral Sandpiper (*Pisobia melanotos*) | 4 |
| Least Sandpiper (*Pisobia minutilla*) | 2 |
| Black Necked Stilt (*Himantopus mexicanus*) | 29 |
| Eastern Mourning Dove (*Zenaidura macroura carolinensis*) | 51 |
| Black-billed Cuckoo (*Coccyzus erythrophthalmus*) | 2 |
| Barn Owl (*Tyto alba pratincola*) | 1 |
| Great Horned Owl (Male) (*Bubo v. virginianus*) | 1 |
| Chimney Swift (*Chaetura pleagica*) | 98 |
| Eastern Belted Kingfisher (*Megaceryle a. alcyon*) | 1 |
| Southern Flicker (*Colaptes auratus auratus*) | 8 |
| Red-Bellied Woodpecker (*Centurus carolinus*) | 3 |
| Tree Swallow (*Iridoprocne bicolor*) | 196 |
| Barn Swallow (*Hirundo erythrogaster*) | 6 |
| Purple Martin (*Progne s. subis*) | 1 |
| Florida Blue Jay (*Cyanocitta cristata florincola*) | 31 |
| Carolina Wren (*Thryothorus ludovicianus ludovicianus*) | 5 |
| Eastern Mockingbird (*Mimus polyglottos polyglottos*) | 95 |
| Eastern Robin (*Turdus migratorius migratorius*) | 7 |
| Loggerhead Shrike (*Lanius l. ludovicianus*) | 4 |
| Starling (*Sturnus v. vulgaris*) | 133 |
| Myrtle Warbler (*Dendroica Coronata*) | 4 |
| Western Meadowlark (*Sturnella neglecta*) | 117 |
| Yellow-headed Blackbird (*Xanthocephalus xanthocephalus*) | 2 |
| Gulf Coast Red-wing (Male) (*Agelaius phoeniceus littoralis*) | 968 |
| Gulf Coast Red-wing (Female) (*Agelaius phoeniceus littoralis*) | 239 |
| Boat-Tailed Grackle (Male) (*Cassidix Mexicanus major*) | 419 |
| Boat-Tailed Grackle (Female) (*Cassidix Mexicanus major*) | 770 |
| Florida Grackle (*Quiscalus quiscula aglæus*) | 1 |
| Cowbird (Male) (*Molothrus ater ater*) | 1,902 |
| Cowbird (Female) (*Molothrus ater ater*) | 769 |
| Louisiana Cardinal (Male) (*Richmondena cardinalis magnirostris*) | 19 |
| Louisiana Cardinal (Female) (*Richmondena cardinalis magnirostris*) | 13 |
| Eastern Savannah Sparrow (*Passerculus sandwichensis savanna*) | 227 |
| Swamp Sparrow (*Melospiza georgiana*) | 15 |
| American Hybrid Coot and Florida Gallinule (*Fulica Americana Americana and Gallinula choropus cachinnans*) | 1 |
| Hybrid Canvas-Back and Redhead Drake (*Nyroca valisineria and Nyroca americana*) | 1 |
| Hybrid Lesser Scaup Duck and Ring-necked Drake (*Nyroca affinis and Nyroca collaris*) | 2 |
| Total | 17,981 |

# SPARROW MIGRATION AT SHIRLEY, MASSACHUSETTS, DURING THE FALL OF 1936

By E. M. DAVIS and W. M. DAVIS

IT seems desirable, in connection with the phenomenal scarcity of migrating passerine birds reported in the northeastern section of the United States, to place on record the results of our banding operations at Shirley, Massachusetts, during September and October, 1936 and to compare them with the results of a similar fall campaign during 1935.

In the January, 1936 number of *Bird-Banding*, pp. 48 and 49, the results of efforts to trap sparrows during the fall migration of 1935 were recorded. This year we set a trap line over the same route, beginning on September 21st and taking in all but two of the traps on October 10th. These two were left until the 16th. The migration was not over on the 10th, but pressure of other work made it necessary to curtail the banding.

Warned by the depradations of chipmunks in 1935, we had four two-cell Potter-type traps ready at the start, and by moving these from station to station as the chipmunks moved in, we caught over twenty of them and had no serious trouble afterwards. No cats appeared this year, but some hounds found the sparrow traps, probably with chipmunks in them, a good many times, and the traps were in a serious condition after each encounter.

The bait was fine chick-feed with either Hungarian or golden millet. Sunflower seed was used in some places, but, except as a bait for Jays and chipmunks, it seemed to have little value. A small amount of ordinary cracked corn was in the mixture, not because we expected it to be eaten but as a possible attraction so that the birds would find the smaller grain.

The total catch of new birds was 804, and up to October 10th, when most of the traps were taken in, the total was 765.

The following tabulation gives in detail the results of the 1935 and 1936 campaigns:

| | *1935* | *1936* |
|---|---|---|
| White-throated Sparrow (*Zonotrichia albicollis*) | 318 | 276 |
| Eastern Song Sparrow (*Melospiza m. melodia*) | 123 | 139 |
| Swamp Sparrow (*Melospiza georgiana*) | 2 | 12 |
| Lincoln's Sparrow (*Melospiza l. lincolni*) | 9 | 20 |
| Field Sparrow (*Spizella p. pusilla*) | 20 | 73 |
| Eastern Chipping Sparrow (*Spizella p. passerina*) | 9 | 167 |
| Eastern Vesper Sparrow (*Poocetes g. gramineus*) | 4 | 6 |
| White-crowned Sparrow (*Zonotrichia l. leucophrys*) | 17 | 10 |
| Eastern Savannah Sparrow (*Passerculus sandwichensis savanna*) | 27 | 25 |
| Indigo Bunting (*Passerina cyanea*) | 0 | 1 |
| Red-eyed Towhee (*Pipilo e. erythrophthalmus*) | 12 | 68 |
| Eastern Purple Finch (*Carpodacus p. purpureus*) | 0 | 1 |

| | | |
|---|---|---|
| Slate-colored Junco (*Junco h. hyemalis*) | 14 | 0 |
| Brown Thrasher (*Toxostoma rufum*) | 1 | 1 |
| Catbird (*Dumetella carolinensis*) | 3 | 0 |
| Blue Jay (*Cyanocitta c. cristata*) | 5 | 3 |
| Eastern Hermit Thrush (*Hylocichla guttata faxoni*) | 0 | 2 |
| Black-poll Warbler (*Dendroica striaba*) | 1 | 0 |
| Total | 565 | 804 |

In addition we captured four Field, two Chipping, and one Song Sparrow returns. These were probably resident birds which had not been trapped during the summer. It should be mentioned that one Song Sparrow and one White-throat that were banded in the 1935 migration were taken in South Carolina during the following winter.

We were much busier with other work this year than in 1935, and it was therefore impossible to keep complete repeat records. Merely banding over a trap-line two miles in length with over thirty traps in operation on the route is almost a day's work in itself, and the last afternoon trip usually ended in a rush to finish before it became too dark.

The birds began to arrive in numbers on September 30th when fifty-six were banded. The peak was reached on October 2d and 3d with seventy-six and seventy-five new birds respectively, and it was not until the 8th of October that there were less than fifty new birds taken daily. It was on the 8th, however, that we found thirteen birds in a trap at one time, which is our record. These were mostly repeat White-throats. The trap was about three and one-half feet long by one and one-half feet wide with seven small funnel entrances. We used several modified Mason traps (the original is described in the last issue of *Bird-Banding Notes*). These did not seem to yield any better results than traps with small funnel entrances except in catching Chipping Sparrows.

As far as we have noticed, no close grouping of species occurred, excepting in the case of Field and Chipping Sparrows. It was not unusual to catch from five to ten of either species in a trap with none of the other species.

The Song Sparrows were in fairly constant numbers, but reached a peak on October 2d with sixteen new birds. The main body of White-throats arrived on October 2d and new birds were in about equal numbers through the 7th, after which there were fewer.

The trap locations were almost identical with 1935 with one exception. An old gravel pit on our farm has a floor about 250 x 100 feet in area and over this is a scattering growth of Broome grass, Andropogon scoparius var. frequens. One day, September 30th, we noticed the Chipping Sparrows eating the seeds, and immediately set a Mason trap baited with golden millet, and the sparrows responded by hopping right in. The pit turned out to be a bander's

gold mine, and before we quit we caught Vesper, Song, Savannah, Field, and White-crowned there, in addition to the Chippies.

The migration this year appeared no greater than last year. The increased total of almost 250 over 1935 can probably be accounted for by the discovery of the gravel pit, the use of Mason traps for Chipping Sparrows and the reasonably prompt elimination of chipmunks.

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## SONG SPARROWS F121239 AND 34-148621 MATES FOR TWO CONSECUTIVE NESTING SEASONS

By LEWIS O. SHELLEY

SONG SPARROWS (*Melospiza m. melodia*) were returning during the latter part of March, 1936. Among those trapped was the pair mated throughout the 1935 breeding season, and recorded in *Bird-Banding*, October, 1935, pp. 137–138. The male was caught in a flat trap on March 27th at 6.50 A.M., a return-3. The female, a return-1, was trapped on March 31st in an automatic trip-door trap at 6.30 A.M. She happened to be taken near the location later selected for her first season's nesting site. From nearly the first of their coming the two birds were distinguished from others of the species present by their actions, and therefore no particular attempt to trap them as repeats was made. They commenced coming to the yard on daily feeding trips, seeking doughnut at the piazza, and the elm feeding unit in the yard, continuing to do so throughout April and well into May.

The accompanying map shows the nest distribution during two nesting seasons. Open circles denote 1935 nests, with solid circles showing the 1936 nesting sites. The nesting territory is directly back of the house, with one (1935) exception. The male's two singing trees and a third singing perch, on the peak of the shed roof, are designated as singing units because of their noticeable commonest use, and are shown on the map as triangular marks. When the urge to sing overtook the male, it was noted repeatedly that he would mount to the nearest place he happened to be at the time. But when within seventy-five to one hundred feet of the occupied nesting site, he would fly to the nearest regular singing perch, which was most often one of the two sapling elm trees on the southern side of the brook. The shed roof was used as a singing perch, it seemed, chiefly because it happened to be the nearest one.

The first 1936 nest, as is commonly the case, was placed on the ground, this time in a tussock of coarse pasture grass, facing the side road and surrounded on the other three sides by a growth of black alder. On May 29th the young were heard calling and, from the parents' actions it was assumed that one or two young had

already left the nest. Three were in the nest, but left at my approach; they were caught and banded 35-127922-3-4. Having been replaced in the nest, two hours later they were again out of it, calling amid the alders. As in the former year, the second seasonal brood was not banded. The second nesting was in the hedgerow by the side road, a veritable tangle of shrub growth. The third brood also left the nest unbanded, on August 2d. The nest was not located until much later, due to its unique situation, which was eighteen inches from the ground atop a roll of chicken wire five

feet from a building back of the house; the walls of the nest were strongly supported by being constructed inside a growing ring of goldenrod stalks growing up through what became the walls of the nest. The situation was sheltered by coarse grasses and various plants, particularly wild asters, and close to the sheltering, overhanging branches of an elderberry bush.

East Westmoreland, New Hampshire.

## PROGRESS REPORT ON THE 1937 HERRING GULL STUDY

By JOSEPH J. HICKEY

As *Bird-Banding* goes to press, arrangements have been completed for the marking of over ten thousand fledgling Herring Gulls with colored celluloid bands. One very interesting and important modification of the original color scheme has been made at the suggestion of Harold S. Peters, newly appointed Atlantic Flyway Biologist of the Survey. By the simple addition of one more color among the celluloid bands, it will no longer be necessary for observers to determine whether bands are on a bird's right leg or left leg.

It is worth emphasizing that aluminum bands still constitute part of each color combination, and that the exact order of the bands on a bird's leg is still necessary in order to make a sight recovery. Thus a report that a bird carried "blue and red bands in addition to a Survey band" will be meaningless. "Aluminum over blue over red" will, however, indicate one colony, "Aluminum over red over blue" will indicate a different one. The three colors to be used on fledglings this year are blue, red and yellow. The few adult birds captured will receive an additional black band.

Banding operations will be carried on in the Great Lakes by W. I. Lyon; at the Razades Islands, Quebec, by Dr. D. A. Déry; at St. Mary Islands in the Gulf of St. Lawrence by Dr. H. F. Lewis; along the Labrador coast by Dr. A. O. Gross and H. S. Peters; at Bonaventure Island by W. M. Duval; at Kent's Island, New Brunswick, by W. A. O. Gross; on the Heron Islands, Maine, by S. Hyde; in Muscongus Bay, Maine, by A. D. Cruickshank; on the Isles of Shoals, New Hampshire, by L. O. Shelley; at Penikese Island, Massachusetts, by C. B. Floyd and L. B. Fletcher; and at Wicopesset Island, New York—the Herring Gull's southernmost breeding point on the Atlantic coast—by W. C. O'Brien.

All reports of recoveries should be sent to "Gull Survey," American Museum of Natural History, New York, N. Y.

## GENERAL NOTES

**A Return-5 Eastern Tree Sparrow and a note on a late migration of a Slate-colored Junco.**—An Eastern Tree Sparrow (*Spizella a. arborea*), A140497, banded at my station in Amherst, Massachusetts, January 15, 1931, was a Return-1 February 17, 1932, a Return-2 on February 9, 1933, a Return-3 December 18, 1933, a Return-4 November 24, 1935 and a Return-5 March 13, 1937. This bird's age on the latter date (March 13, 1937), assuming that it was a juvenile in 1930, was six years old when last taken. If it was an adult in 1930 its age was seven years on the above date.

A Slate-colored Junco (*Junco h. hyemalis*), 37-24206, banded at the Austin Ornithological Research Station on Cape Cod, Massachusetts on November 1, 1936, was recovered by me in Amherst on December 5, 1936, and again on February 5, 1937. This record is of interest as it shows, (1) a migratory movement very late in the season and (2) a migration direction 17 degrees north of west. —Mrs. Frederick Morse Cutler, Amherst, Massachusetts.

**A Case of Superparasitism.**—Last summer two Eastern Cowbirds (*Molothrus a. ater*) were reported from the nest of a Black-capped Chickadee (*Penthestes a. atricapillus*) in a nest-box at the Austin Ornithological Research Station on Cape Cod (*Bird-Banding*, VII, 129). The nestling Cowbirds were removed to the laboratory and examined for ectoparasites. Both birds were infested with several hippoboscid flies (*Ornithomyia anchineuria*). Further study of these flies has revealed two Mallophaga attached to the sides of the abdomen of one of the hippoboscids. Such observations have been made by other investigators and C. W. Johnson (*Psyche* XXIX, 79–85) has suggested that this may be a means of transportation of the Mallophaga from one bird to another. However, the present case seems of particular interest because of the fact that we have a parasite (Mallophaga) on a parasite (fly) on a parasite (Cowbird).—Carlton M. Herman, North Eastham, Cape Cod, Massachusetts.

**A Bronze Grackle** (*Quiscalus quiscula aeneus*) **A Six-Year-Old Return at Peterborough, New Hampshire.**—At my station in Peterborough, Bronzed Grackle, B3337440, was banded on April 14, 1932. The bird was one of a small flock arriving about this time, and as the species was seen about the town in the summer, no doubt they breed here. On May 6, 1937 the bird was found dead by Mrs. Mary Farrar in her garden situated approximately 1,200 feet from my banding station. It had evidently suffered severe injuries, presumably by a passing automobile, for one leg was broken. The bird was in an advanced stage of decomposition so that it no doubt had been dead possibly several weeks when found.—Jesse V. Miller, 99 Hillside Avenue, Manhasset, Long Island, New York.

## RECENT LITERATURE

(Reviews by Margaret M. Nice and Thomas T. McCabe)

The articles have been selected and arranged under subjects of importance to students of the living bird, and also for the purpose of suggesting problems, or aspects of problems, to those banders who wish to make the most of their unique opportunities.

Headings in quotation marks are the exact titles of articles or literal translations of such titles. Except in the case of books, which are always reviewed under their titles, headings not in quotation marks refer to general subjects or are abbreviated from titles in foreign languages. References to periodicals are given in italics. Reviews by Mr. McCabe are signed with his initials.

## BANDING AND MIGRATION

**"The 'British Birds' Marking Scheme Progress for 1936."**—H. F. Witherby. 1937. *British Birds*, 30:337–342. In 1936, 48,663 birds were ringed in great Britain, 19,235 of which were trapped, while 29,428 were nestlings. The grand total since 1909 has reached 530,733. Thirteen individuals and stations ringed over 1,000 birds last year. A list is given of the numbers of each species ringed and recovered during the 28 years. Recoveries are high with Titmice due to trapping 15.5–18.3 per cent, and with some other species due to shooting: Ducks 4.4–18.4 per cent, Cormorants 18.6 per cent, Hawks 5–23.6 per cent.

**"Results of Ringing Coots in Switzerland."**[1]—*Fulica a. atra* is both resident and winter resident in Switzerland; the latter breed to the northeast, one being taken 2,000 km. distant. They often return to the same lakes each winter. Speed of migration may reach 262 km. (160 miles) in a day. Age records of 5 to 9 years have been obtained. Of 656 Coots banded, 14 per cent were retaken, most of them having been shot.

**"Researches on the Migration of the Quail** (*Coturnix coturnix coturnix L.*) **in Italy."**[2]—Of 1,011 Quail ringed at Lago del Garda, between 1930 and 1933, 192 were retaken—19 per cent. Prince Chigi reports birds retaken in migration at Castel Fusano after one, two and three years. The last birds of the spring migration are adults that have nested in Africa and their young.

**"Bird Banding Brevities—No. 10."**—A. R. Laskey. 1937. *The Migrant*, 8:2–4. From her station at Nashville, Tennessee Mrs. Laskey reports a Return-5 of a Maryland Yellow-throat (*Geothlypis t. trichas*) banded September 9, 1932, retaken September 19, 1936 "his fifth season at the station"; and winter returns of the following: 3 White-crowned Sparrows (*Zonotrichia l. leucophrys*) "banded in 1933, returned this year for their fourth winter, one of which was banded as an adult and is now at least 5 years old"; a Gambel's Sparrow (*Zonotrichia l. gambeli*) for its third consecutive season and White-throated Sparrows (*Zonotrichia albicollis*) for three years. As to Mockingbirds (*Mimus p. polyglottos*), during this mild winter, the 3 "male territory holders have been more zealous in boundary line demonstrations than were the territory holders during the unusually severe winter of the previous year. This was particularly noticeable in the frequent dancing, (the hopping forward, backward, sideways, as the two participants face each other), the more frequent fights, and the earlier singing."

**"'Migration' and 'Homing' of Salmon."**—A. G. Huntsman. 1937. *Science*, 85 (March 26):313–314. In quite a number of instances "salmon tagged in one river have been recaptured in another, which constitutes definite evidence against homing." Salmon tend to remain in the zone of influence of their natal rivers; if a fish gets "very far from this zone of river influence there is little likelihood that it will in its random wanderings reach the place where the marked gradient occurs. It may then be said to be 'lost.' Such salmon may reach neighboring rivers or travel very far in the sea."

[1] Schifferli, A. 1937. Ergebnisse der Schweiz-Blässhuhnberingung. *Der Ornithologische Beobachter*, 34:93–99.

[2] Duse, A., F. Chigi, A. Agostini, M. Rotondi, C. Paolucci, and A. Toschi. 1935. Ricerche sulla Migrazione della Quaglia (*Coturnix coturnix coturnix L.*) in Italia. *Ricerche di Zool. Appl. alla Caccia*, 9:1–125.

## LONGEVITY

**"Further Notes on a Very Old Cardinal."**—A. F. Ganier. 1937. *Wilson Bulletin*, 49:15–16. A male *Richmondena c. cardinalis* lived to be at least 13 and one-half years old. The winter of 1935–36 was one of the coldest of record yet he came through it well, although showing signs of age by crouching as he ate, and the molt was slow and tedious. He and his young mate of April, 1935 remained

constantly together through the winter; they made 3 attempts at nesting in 1936, the last of which was successful. On August 3d, a male Towhee drove the Cardinal from the feeding shelf where he had eaten for years, and he never returned there, taking up quarters at a different shelf, and paying no attention to his mate. He was last seen November 20, 1936, having been banded February 12, 1924.

**A House Finch** (*Carpodacus mexicanus frontalis*) over 10 years old was retaken by Mrs. J. R. Michener, (*News from the Bird Banders*, 12:8. 1937).

Other data on longevity may be found in Number 1 and in the paper on the Golden Eagle.

## LIFE HISTORY

**Further Increase in the White Stork in East Prussia.**[3]—In the Insterburg region, in 1935, 692 pairs of *Ciconia c. ciconia* raised 1,070 young, an average of 1.5, but in 1936 749 pairs raised 1,726 young or 2.3 per pair. All but 11 of these young were banded. In 1935 there was snow in May which probably killed the animals on which the Storks prey; 30 per cent of the nests were empty, but in 1936 only 14 per cent. Birds banded in the nest were found breeding 5, 15, 160 and 180 km. from their birthplaces. Seven of these new breeders were four years old and two three years old.

**"The Home-Life and Economic Status of the Double-Crested Cormorant** *Phalacrocorax auritus auritus* **(Lesson)."**—University of Maine Studies, Sec. Ser. No. 38:1–159. $1.00. An excellent study based on careful prolonged observation from blinds for two seasons on Marblehead Island, Maine. Territory is "limited to the nest and a very small area surrounding it." "Cormorants are very jealous of their territories, but an intruder usually leaves at the appearance of the rightful occupant." Incubation lasts 24 and one-half to 25 days, and is performed by both sexes, the birds relieving each other at intervals of 1–3 hours. Parents continue to feed offspring long after flight is acquired. About 6 meals a day are served. An interesting account is given of the development of the young. Parents know their young, but young do not know their parents. However, a strange young bird is repulsed gently. "The affection shown by the paired birds for each other during courtship lasts throughout the breeding season." The picture is of an attractive, amiable, highly socialized bird, its general behavior based largely on instinct, each individual showing a surprising degree of individuality.

**"Nesting Habits of the Brush-Turkey."**—D. H. Fleay, 1937. *Emu*, 36:153–163. Another of Mr. Fleay's admirable accounts of the nesting of large and peculiar Australian birds in captivity, under conditions so adequate, in the Melbourne Zoo, and under so profoundly differentiated a pattern of behavior, that they must reflect the natural cycle unusually well. The strange basic factors in the breeding of *Alectura lathami* Gray begin with the immense industry of the male in building the huge incubation mound, unstimulated by, and indeed hostile to the female throughout. "In fact the hen bird has rather an uncomfortable lot except during the few brief moments when she is graciously permitted to place an egg in the 'incubator' provided by her egotistical lord and master." Unnatural intelligence is continually suggested, whether by judging temperature deep in the pile by the bare skin of the neck, or by uncanny ability to open the crater before rains. One wishes that a long and precise record of the latter feat might be kept and published. Copulation is exceedingly rare and occurs on the finished pile (insofar as the pile is ever finished). Almost all parental instinct is devoted to the pile. The male may, on rare occasions, display a strange mid-wifery by digging toward an emerging chick, but beyond that there exists only indifference or hostility on the part of both parents, though the male does not bully the small chicks as he does the hen and their older progeny. One wonders whether this reflects natural behavior with accuracy. It is true, certainly, that the chicks are precocial to an extreme degree. Another fact it would be interesting to check in

the wild is the breeding of a pair both in their first year. In 26 months one male on one mound, with one female and a daughter taken as an additional mate at the end of a year, produced 60 chicks, with many more eggs in the mound at the time of writing.—T. T. McC.

**"The Breeding Biology of Certain East African Hornbills** (*Bucerotidae*)." —R. E. Moreau. 1936. *Jour. East Africa and Uganda Natural History Society*, 13:1–28. A very interesting study. Two nests of the Silvery-cheeked Hornbill (*Bycanistes cristatus*) were watched. The birds "probably pair for life," as couples are "seen together all round the year." The species is highly gregarious both in feeding and roosting; 200 birds may roost together for 13 hours out of the 24. The female builds the wall of the nesting chamber with pellets of dry earth brought her by her mate; in one day the male impregnated 33 cubic inches of soil with saliva. The pair worked usually from about 10 A.M. to 2 P.M. The female stayed in the nest 108 days; she and the single young bird came out at the same time. The male had made some 1,600 visits with food, bringing about 24,000 fruits. (A total of 26 all day records—twice each week—were made at this nest by African observers.) At first the male averaged 12 visits a day, later 21, decreasing near the end to 16–19. A large proportion of the birds do not breed every year; suitable holes must be hard to find and a male's saliva may be inadequate for the task of plastering.

With two other species (*Lophoceros deckeni* and *L. melanoleucos*) the female broke out of the hole when the young were partly grown and the latter—in each case two birds—repaired the plaster themselves.

**"On the Behaviour of Male Mallards with Broods."**—Bertram Lloyd. 1937. *British Birds*, 30:334–336. Although male *Anas p. platyrhynchos* customarily pay no attention to their offspring except occasionally to kill them, on Tring Reservoirs in 1936 five or six male Mallards were seen swimming with their mates and broods, some of which were young, others half grown. In four cases the males were swimming in the van of the brood.

**"The Golden Eagle in San Diego County, California."**—J. B. Dixon. 1937. *The Condor*, 39:49–56. *Aquila chrysaëtos* is a common resident in San Diego County, where the author has studied it since 1900. A map shows the territories of 27 pairs; these range from 19 to 59 square miles, averaging 36, or a township. One female is believed to be 30 years old. "Eggs of young eagles are larger and more heavily marked than eggs from older females, and the eggs gradually decrease in size and increase in thickness of shell." Eggs on one territory were always infertile. Area 1 had 4 distinct nesting locations and 11 nests; area 2 had 4 locations and 12 nests. Some nests are on cliffs, others are on trees. If the first laying is destroyed, the bird lays again in 28 days. Occasionally there may be as many as 3 or 4 layings when food conditions are good and the birds in the prime of life. "Nest building begins with the first heavy fall rains and continues through the winter." A new nest is not used the year it is built. Both sexes incubate. A female that has lost her mate may build and lay and then go to get a new mate! Old birds are sometimes banished and a new mate substituted. A very interesting article, but one wishes for more details on certain phases of behavior.

**The Crowned Eagle.**[1]—*Stephanoaëtos coronatus* is the king of forest birds in Africa. It nests high in trees and the young are not fledged until the age of 7 or 8 months. The female stays in the tree with the young bird, while the male brings food, but comes only once or twice a day despite the cries of the female. They are much attached to their young; the female of one pair had been captured and later the young; after this second loss, the male flew about for 8 days calling desperately. Each pair has a large territory. They prey on monkeys and capture them in this manner; the bird hides in the foliage near a band of monkeys and whistles softly; the females and young flee, but the old males approach threaten-

ingly. Suddenly he pounces on the nearest monkey. The author could attract enraged monkeys within a few meters by imitating the Eagle's whistle.

**"Notes on Breeding-Habits of a Pair of Stock-Doves."**—C. P. Freeman and G. L. Bates. 1937. *British Birds*, 30:302–304. Supposedly the same pair of *Columba oenas* bred in a hole in an elm tree for 4 years. The number of broods per year was 4–5; 33 eggs were laid and 24 young fledged. Incubation period was 18 days; fledging period 28–29. Twice "eggs were laid in the nest when it was still occupied by two young ones, on one occasion for as long as nine days or more."

**"The Dance of the Prairie Chicken."**—John S. Main. 1937. *Wilson Bulletin*, 49:37–42. This is a lively and detailed description of the dance of *Tympanuchus cupido americanus* as watched from a blind near Lake Mills, Wisconsin, followed by a discussion of the seeming purposelessness of this and so many generically similar performances by gallinaceous birds. In the case in point one female did come to the booming ground, which is apparently unusual, but displayed no interest and did not mate.—T. T. McC.

**"Life-History of the Black-chinned Jacamar."**—A. F. Skutch. 1937. *Auk*, 54:127–146. A charming article on a beautiful bird, describing its vivid plumage, attractive notes, "delicacy of form, grace and dash of movement," and the "mutual affection of the mated pair." *Galbula melanogenia* belongs to the order Piciformes. Nesting holes are excavated in banks. The female of a pair that Mr. Skutch watched in Guatemala did most of the work at first, but later her mate took an almost equal share, at the same time bringing her dragonflies and Morphio butterflies to eat. The birds incubated in two to two and one-half hour shifts, the female spending the night on the nest.

**"Recent Observations of the Ivory-billed Woodpecker."**—A. A. Allen and P. P. Kellogg. 1937. *Auk*, 54:164–184. Very interesting paper on this, one of the rarest of American birds. Several pairs of *Campephilus principalis* in Louisiana were studied, motion pictures taken of them, and their calls recorded on film. They were found to be strikingly sedentary and local in distribution. The male incubates at night; during the day the birds exchange places, often staying 2–3 hours at a time, but sometimes only 25 minutes. Theories as to reasons for the great scarcity of the species are suggested. The paper is illustrated with magnificent photographs.

**"The Life of the Great Spotted Woodpecker."**—Although *Dryobates major* is solitary most of the year, Titmice and others often associate with him, their highly developed sociability making him "leader" despite himself. Both sexes drum in late fall, winter and spring. Dr. Steinfatt watched 12 nests, spending 109 hours at one hole. The male incubated at night and more in the day time than the female. Periods on the nest were short. On the 6th day of incubation the male was caring for the nest alone from 5.30 P.M. till dark at 7.43; he incubated in stretches of 4–25 minutes, averaging 10 minutes, a total of 79 minutes on the nest and 54 off. Incubation lasted 12 days. The male did all the brooding at night and most of it in the day time. The nest was watched all day just after the young hatched. The female came 10 times and brooded a total of 115 minutes, staying from 3–28 minutes at a stretch. The male made 41 trips and brooded 446 minutes from 1–28 minutes at a time. He was away 418 minutes from 2–65 minutes at a time. The young were brooded 561 minutes, or 65 per cent of the day.

**"The Male Flicker's Part in Incubation."**—A. F. Skutch. 1937. *Bird-Lore*, 39:112–114. The male incubates at night and also the greater share of the day. On a nest that was watched all day the male incubated 501 minutes and his mate 327 minutes in 3 sessions. The author mentions 4 Central American species where the male incubates at night: White-billed Pileated Woodpecker (*Clophlocus lineatus similis*), Truxillo Woodpecker (*Centurus sanctacruzi pauper*), Guatemalan

Flicker (*Colaptes m. mexicanoides*) and Guatemalan Hairy Woodpecker (*Dryobates villosus sanctorum*), and also the Red-bellied Woodpecker (*Centurus carolinus*). The same is true of the Ivory-billed and Great Spotted Woodpeckers as just related and also of the Lesser Spotted Woodpecker (*Dryobates minor*) as reported by Schuster (see *Bird-Banding*, January, 1937).

**"The Song of the Mistle-Thrush."**—George Marples. 1937. *British Birds*, 30:305–306. For 3 years a pair of *Turdus v. viscivorus* built in the same fork of the same tree in Hampshire. The male was "first heard to sing on January 24th and from that date he sang throughout the day from dawn to dark until the middle of May, a singing period of three and a half months." His "daily average singing time was just over 11 hours during which he sang almost continuously."

**"Nesting Distribution of the Tricolored Redwing."**—J. A. Neff. 1937. *Condor*, 39:61–81. *Agelaius tricolor* exhibits an "extremely erratic nature" "both in winter and in summer." Sometimes colonies are scattered widely over most of California, in other years there are great concentrations in a few places. They are intensely gregarious. "It has sometimes been definitely known that no Tri-colors frequented a certain marsh for weeks. Suddenly—within a few hours—a horde of the birds arrives and deploys to feed; within a few hours of arrival the entire band has been busily engaged in gathering nesting material, and by the end of the second day eggs have been noted in the nests. Indeed, on several occasions the birds appear to have dallied along the way, and eggs were deposited in unfinished nests, and in a few instances upon the ground close to the marsh." High winds sometimes cause desertion of nests. "Cooper's Hawks fed upon the adults of one colony until it deserted the nests."

**"A Nest-Building Male Song Sparrow."**—William E. Schantz. 1937. *Auk*, 54:189–191. Normally in Columbus, Ohio, the male *Melospiza melodia* takes no part in building the nest. Another departure from rule was the raising of 4 broods in one nest during one year. The male, which was very tame, showed three types of behavior when his young were held captive by the author: attempts to lure them away, to intimidate the enemy, and finally typical injury-feigning or nest-protecting display. In 1936 the female was very despotic towards her mate.

[3] Hornberger, F. 1937. Neue Feststellungen über Brutbestand, Ortstreue und Reife der Ostpreussischen Weiss-Störche im Ermittlungskreis der Vogelwarte Rossitten. *Beiträge Fortpflanzungsbiologie der Vögel*, 13:56–62.

[4] Maclatchy, A. R. 1937. Contribution a l'Étude des Oiseaux du Gabon Meridional (Suite.) *L'Oiseau et Rev. Franç. d'Ornithologie*, 7:60–80.

[5] Steinfatt, O. 1937. Aus dem Leben des Grossbuntspechtes. *Beiträge Fortpflanzungsbiologie der Vögel*, 13:45–54.

## BIRD BEHAVIOR

**"Observations and Investigations of the Biology of the Herring Gull (*Larus a. argentatus* Pontopp.) on the Bird Island of Memmertsand."**[6]—The burden of this splendid study of the five or six thousand gulls of a dune and grassland islet off the German North Sea coast is breeding behavior and its psychological mechanism, the observation of response, the confident, almost naive, search for primary and integral stimuli, the groping ambition to weld the whole into an organic pattern. A running commentary on parallel studies amounts to a critique or check of many papers by Lorenz, Portielje, Leege, Leverkühn, Steinbacher, Culemann, Direksen, Heinroth, Naumann, Noll, Strong, Watson and Lashley, and others. The work was largely carried on (with the aid of an assistant) from a dwelling cabin at the edge of the colony and from blinds a few feet from the nests. Manipulation of nests, eggs, young, and natural or artificial local detail amounted to an ambitious experimental program. Colony behavior, thought to differ from that of the same species in captivity or isolation, was the object emphasized.

Many of the birds arrived paired, though they are not believed to remain paired all winter, and at once took territories on April 22d. Copulation was common by April 27. Play nests appeared at once, real nests from May 9th on. Laying was general after May 10th; most young hatched from the middle to the end of June. Rhythmic general movements to and from the feeding grounds cease, except for the foot-loose birds, with the beginning of brooding. No birds bred in immature plumage. The vocal utterances are divided into twelve types, about half of which possess highly specialized significance. Several recognizable pairs were known to have bred for years on the same site.

There are numerous spectacular elements in the approach to breeding. 1. The assumption and defense of rigid small territories, in which the all-important element is the even more fixed "Standplatz," or post, of the male (during brooding of the unoccupied bird) which is to become the center of activity for old and young; 2. The extremely common "plucking game," usually between male and invading male, suggesting a trial of strength by plucking grass or sod, advancing, retreating, varying with temperament and stage of cycle, rarely inflamed to actual combat, and, if so, usually degenerating again to "plucking;" 3. The nest-ceremony, believed by the author, though not by others, quite distinct from the plucking game, though it sometimes involves pecking at the ground. It seems essentially distinct from territorialism and other elements of breeding biology, and may occur far from the nest, though some connection with nest cavity or sand-baths is rather regular, and mock-copulation may, rarely, enter into it. Many purposes, such as advertisement of possession or even repulsion of invaders may occasionally be served. The author sees in it a certain vague intensification of unity, and "expression of like-mindedness." It occurs most often at the meeting of a pair at the post, and consists in rushing together, standing with the hinder parts raised, squatting, with characteristic utterances, nodding, gulping, and apparent thickening of the neck. Spasms of both (2) and (3) may run over the colony like wildfire; 4. Building up to as many as four play-nests, usually abandoned, sometimes finally used, often used as resting nests by the female; 5. Decoration of the nest site with odd objects like shells or bones; 6. Begging by the female and responsive regurgitation by the male, undoubtedly sexual and independent of hunger; 7. Copulation-rehearsal, in which the interest of the female (and this is true even through actual copulation) lies in the bill of the male and in begging as for food, which the male pretends to feed her but never does. Unlike most birds, stimulation is undoubtedly of the female by the male. Copulation is usually at the post, sometimes on the beach, and stolen matings are rare. Here also, waves run over the colony.

Mates undoubtedly know one another, even flying over, and without voice. There is eternal fear of *spread wings*; of the *arrival* and *departure* of closest permanent neighbors, or even mates, while one bird, in a defensive frenzy, was seen to bite his own outstread wing. As an example of crowding, in one case three nests, around a protective shrub, lay within a square meter. Tolerance of approach, before laying, varies with the stage of the cycle. The female does not commonly fight in defense.

Nest construction usually takes about three days; material and site are enormously variable. Even when the ground is alike, the margins of the colony are far more crowded than the center. The inter-egg interval is most often two days (from 24 hours to three days). The male broods about one-third as much as the female. Removed eggs are recovered only if within some 15 centimeters, and then may have a new nest built around them. Very slight movement of the nest makes the pair disown it. Egg-theft is a prevalent vice originating with bold, unpaired thieves and spreading, through the taste of the eggs so broken, to respectable breeding pairs. Rival thieves at an unprotected nest may use the plucking game or other elements of breeding behavior. Most of the colony loses at least one clutch.

Owners of more crowded nests begin—perhaps are forced to begin—brooding more promptly than isolated pairs. From the first pip to escape from the shell takes from two to three days, and the cries of earlier-hatched young seem to

stimulate the struggle. In spite of decided preponderance of non-breeding adult males, the sex-ratio at hatching is close to 1 : 1. The first pecking at moving objects, which is thought to represent first hunger, may be in ten hours after hatching. The young stop begging and squat at the alarm call within twenty hours. The call was equally well-heeded by a house-hatched downy young placed in a nest. An elaborate demonstration of the importance of the red bill-spot to the begging young is of extraordinary interest. There is a sudden general change in food, notably from mollusks to crabs, at hatching time. The young begin to wander very early and have amazing ability to get back home through the hostile colony both by their own senses and habits and by recognition of the "help calls" of their parents.

There is great individual variation in the development of faculties such as defensive biting, notes of protest, and fear of man. Mutual recognition is amazingly sure and is the subject of much experiment and speculation. Even in the least prevalent section of the colony the theft and killing, and often eating, of young by adults amounts to from 5 to 10 per cent. Here again, parents may acquire the habit, but do not kill their own young. The female parent, at first solicitous of the young, rapidly loses interest, while the lasting defensive behavior of the male may reach actual fury. The most extensive experimentation dealt with the power to find their own nests and posts of the adults, which are almost impossible to deceive, far more difficult than Watson and Lashley found in the case of *Sterna fuliginosa*. Knowledge of detail and of the "lay of the land," optic and kinaesthetic senses at least, reach complex interplay, while the search for lost (removed) nests displays unexpected psychological plasticity. Although the population is not migratory, of the many adults carried away, alongshore or inland, up to distances of 450 kilometers, 84 per cent returned.

It is hard to praise the effort too highly, yet the lesson may be that with the pyramiding of modern information and the ramification of the old ornithology into a dozen fields of scientific specialization, even so well-delimited a study is too great for one man in one season to attain any single objective of the type and caliber to which the paper aspires.—T. T. McC.

**"A Study of Nocturnal Behavior of Some Wild Birds."**[7]—Roosting habits of many birds in France are described. Some diurnal birds see fairly well at night, others poorly.

**"A Contribution to the Question of the Driving Away of Grown Young By the Adults."**[8]—Do adults drive off their young, or do the latter wander away? The author banded a pair of Nuthatches (*Sitta europea*) and their six 10-day-old young on May 19th with colored bands; on June 12th he noted one young bird at a distance of 1.5 km., but the rest were still with their parents and still being fed. He concludes that no force had been used in this case. The reviewer has seen parent Song Sparrows drive off their own grown young.

**"Injury-feigning by a Wood Duck."**—A. A. Saunders. 1937. *Auk*, 54:202–203. A female *Aix sponsa* that had a brood of 9 young was attacked by a Red-shouldered Hawk (*Buteo lineatus*); the ducklings scattered and their mother "turned on one side, flapped one wing in the air and paddled about in circles as though quite helpless. The hawk immediately turned and struck at her," but she evaded him. Four or five times she "deliberately came out into the open," "evidently enticing the hawk gradually away from the vicinity of the young."

[6] Goethe, F. 1937. Beobachtungen und Untersuchungen zur Biologie der Silbermöwe (*Larus a. argentatus Pontopp.*) auf der Vogelinsel Memmertsand. *Journal für Ornithologie*, 85:1–119.

[7] Labitte, A. 1937. Étude sur le Comportement Nocturne in Natura de quelques Oiseaux. *L'Oiseau et la Rev. franç. d'Ornithologie*, 7:85–104.

[8] Stechow, J. 1937. Ein Beitrag zur Frage des Vertriebenwerdens der erwachsenen Jungvögel durch die Alten. *Beiträge Fortpflanzungsbiologie Vögel*, 13:54–55.

## ECOLOGY AND CENSUSES

**"Ecology of the Birds of Quaker Run Valley, Allegany State Park, New York."**—A. A. Saunders. 1936. New York State Museum Handbook 16:1–174. On 15,276 acres of forest and 1,691 acres of open couuntry the author mapped the habitats and censused the nesting birds by counting the singing males over sample areas during the early mornings of the first two weeks in July in 1930 and 1931. He does not clearly explain his methods, but states that he easily covered 100 to 200 acres a morning, counting singing birds within 50 paces on either side. The foundation for the study is well conceived and the flora of the habitats thoroughly described, but I feel that he must have gravely underestimated the bird population. Moreover, my experience leads me to believe that this underestimation did not operate evenly in the different areas, and hence that doubt is thrown on a number of the author's conclusions. In many species singing of the male is irregular after nesting has started; indeed, Mr. Saunders himself has pointed this out for the Field Sparrow, writing that many individuals "are silent for much longer periods than a week, even right in the midst of the song period" (*Auk*, 1922, p. 397), and again, "Every Field Sparrow I have studied individually has exhibited it" (irregularity in song period), and finally, "It is common in many other species as well" (*Auk*, 1924, p. 248). With Song Sparrows in early July probably less than a half of the males might be expected to be singing, and I have found that (except in early spring) Robins sing very little after sunrise. Indigo Buntings and Northern Yellow-throats have also been undependable in their singing.

It is interesting to note that Mr. Saunders' most abundant breeders are the Black-throated Green Warbler, Red-eyed Vireo and Ovenbird, all notable for their tireless singing. I believe that his censuses in open areas suffered more from underestimation than those in the woods, because many of the dominant species of the former habitats are irregular in their singing, while those of the latter sing uninterruptedly. The highest population was found in mature maple-beech, namely 182 pairs per 100 acres. A. B. Williams (*Ecol. Mon.* 6:1–92, see *Bird-Banding*, April, 1937) with his careful weekly counts throughout the season on 65 acres of such forest in northern Ohio found from 2.0 to 2.7 pairs per acre over a series of four years.

Mr. Saunders says, "Let us assume, as a hypothesis, that any natural area supports all the bird life that can live there and that over an area where conditions are uniform the species of birds found and the proportions of those species will be the same." p. 26. I would not agree with this; I would rather say that the number of birds fluctuate below an optimum. Dr. Williams found marked fluctuations in the numbers of breeding birds, although conditions that might effect the birds remained practically unchanged.

An excellent discussion is given of "Succession in the Maple-Beech forest following cutting," as well as an interesting study of the ecology of the Ruby-throated Hummingbird (*Archilochus colubris*) which is dependent on the blossoming of the bee balm (*Monarda didyma*), and delays its arrival and nesting until the second week of July, when this flower is in bloom.

This very interesting paper is worth careful study. Mr. Saunders well says, "We must first base our knowledge on the ecological distribution of birds on natural areas, and make these studies before the natural areas are all gone."

**"A Statistical Survey of the Winter Bird Life of Southeastern Ohio-Muskingum County."**—L. E. Hicks and C. A. Dambach. 1936. *Wilson Bulletin*, 48:273–275. A survey of birds recorded on 25 all-day censuses between December 15th and February 15th, a typical trip lasting 8 hours and covering 6–7 miles on foot and 60 miles by car. Roosts of 32,000 Starlings (*Sturnus v vulgaris*) and 12,000 Crows (*Corvus brachyrhynchos*) were located in the county; these birds "have made a decided drain upon many winter food resources ordinarily available to other species." Sixty-five species were recorded. The authors give total numbers seen, per cent of days on which seen, average number seen per

day, and rank of species in Ohio, which was found by a study of the Christmas census throughout the state and "taking into equal consideration (1) the numbers occurring and (2) the percentage of trips upon which each was found."

**"Bird-Lore's First Breeding-Bird Census."**—1937. *Bird-Lore*, 39:147–150. An admirable plan for a start on a scientific study of breeding bird populations.

## SEXUAL PERIODICITY AND LIGHT

**"Sexual Periodicity and the Causes Which Determine It."**—F. H. A. Marshall. 1936. *Phil Trans. Roy. Soc. London.* Ser. B. Biol. Ser. No. 539. Vol. 226:423–456. A valuable historical review of the whole subject, discussing the gonads, anterior pituitary, effects of light, other exteroceptive factors (relations between the sexes, removal of eggs, etc.) and meaning of sexual display. Some of the authorities on bird habits seem rather ancient—1882, 1848, and 1842. The purpose of sexual display is considered to be mutual stimulation and synchronization (the author does not refer to A. A. Allen's paper in *The Auk*, 1934, pp. 180–199). Interesting quotations are given from the Marquess of Tavistock as to the adaptibility of various species brought to England from the Southern Hemisphere in the matter of breeding seasons. "The emu shows little willingness to adapt itself to our seasons," but the Rheas always do so and the Ostrich usually. "Birds from North Australia are markedly more inclined to stick obstinately to their own breeding season (October)." Parrakeets from Southern and Central Australia adapt themselves to our seasons at once.

**"Light and the Sexual Cycle of Game Birds."**—L. B. Clark, S. L. Leonard and G. Bump. 1937. *Science*, 85:339–340. Absence of light inhibited the onset of sexual activity in Ruffed Grouse and Pheasants. Continuous illumination during the winter months stimulated egg laying a month early (after three and a half weeks of light treatment), but did not prevent its cessation, the bird laying 14 eggs and then stopping.

## BOOKS

**Adventures in Bird Protection.**—T. Gilbert Pearson. 1937. New York. Appleton-Century. 459 p. $3.50. This is a tale of heroic labors, the chronicle of a self-made man who started from humble beginnings with no advantages of books or teachers, and became a power for conservation. It is a story of battles against game hogs, politicians, and milliners, in which the author's eloquence, knowledge of human nature, unflagging zeal and dogged determination brought victory for the birds. This is an important history of bird protection in America, well documented and well written.

**Vertebrate Animals of Point Lobos Reserve, 1934–35.** Joseph Grinnell and Jean M. Linsdale. Carnegie Inst. Washington, Pub. No. 481. 159 p. A survey of the vertebrates, treating of their environmental relations and discussing each species in some detail as to its occurrence and something of its behavior. Life history notes are given on various birds, as polygamous behavior of Redwings, antagonism between Pygmy Nuthatches and Western Bluebirds, location, contents, and dates of nests of many species, etc. The authors emphasize the prime necessity of leaving nature undisturbed in this reserve. "Here is a rare and much needed opportunity to cultivate a high order of discriminating appreciation of nature by, it is hoped, an ever increasing portion of Californians and visitors from elsewhere."

**Cleveland Nature Trails.**—A. B. Williams. *The Cleveland Press.* Public Service Bureau. 10c. A series of 13 articles on nature topics, birds, flowers, trees, and mammals, illustrated with many photographs, and a map of the reservations around Cleveland, Ohio. This is an excellent educational project and could well be copied by newspapers in other cities.

**The Distribution and Habits of Madagascar Birds. Summary of the Field Notes of the Mission Zoologique Franco-Anglo-Americain à Madagascar.**—A. L. Rand. 1936. *Bull. Amer. Mus. Nat. Hist.* 72:143–499. On the basis of two years spent in study and collecting on the Island, the author discusses distribution of birds in relationship to the three chief faunal areas, the humid forest in the east, the savanna districts, and the sub-desert. "The breeding season corresponds with the austral summer which is the rainy season. . . . A few birds breed throughout the year." In the forests outside of the breeding season, birds were concentrated in large flocks of various species that moved rapidly and fed "from the tree tops to the ground-cover." It is suggested that "mutual starting into activity of the world of organisms on which the birds prey may be a factor from which the members of the flock derive a mutual advantage." Notes are given on habits of some of the peculiar birds of Madagascar. Bensch's Rail (*Monias benschi*) appeared never to fly; one female was often found in company with several males, and it is the latter that incubate the single egg and care for the young.

**Studies in the Life History of the Song Sparrow I,**—[9]This book is the report of an extremely intensive study of a Song Sparrow population conducted at Columbus, Ohio during the eight years 1929–1936. This reviewer concurs with the verbal statement made by several ornithologists most familiar with the work —"the finest and most comprehensive study ever made of any North American bird." The scope is much broader than that of the usual study of a single species. Data concerning 126 other species from all parts of the world are compared with Song Sparrow events. In fact, this book can well serve as the best available text on life history-population problems. The subject index with 385 study topics and the bibliography with 269 selected references on life history reports, should be of inestimable value to any student in this field.

Through trapping, banding, and continued search, individuals were traced through their lives, and family histories established, the place of residence of relatives determined and the inheritance of migratory behavior, song characteristics, egg color, etc., investigated. This volume deals with the Song Sparrow and its environment, its ecology, migration, territory, and reproduction, all from a statistical point of view, and finally with survival problems. A second volume is planned which will deal with behavior and the details of territory establishment, "courtship" and song.

This work is a splendid example of modern study techniques based on banding, the unique advantages of which are the opportunity to study the subjects in the hand, weighing, measuring and noting details of condition, and the possibility of absolute identification in the field through the means of colored bands. It is a most convincing demonstration of the wealth of untouched research opportunities which exist in the "backyard" of every ornithologist—of the nearly universal blindness to significant bird events. Other common species should prove equally rewarding to other investigators.

The climatic and biotic factors governing Song Sparrow populations are carefully reviewed. The next chapter reveals that the chief life events are faithfully reflected in shifting body weights. The birds studied fell into four categories: transients, winter residents, summer residents and permanent residents. The section on the relation of the expression of the migratory instinct to environmental and hereditary influences, makes a real contribution to that subject. The portions which contain the most significant creative work are probably those which deal with territory and the development of a "life quotient" through an exhaustive analysis of reproduction and survival data.

The chapter on "The Cowbird in Relation to the Song Sparrow" is a classic treatise on the difficult topic of species interrelationships and should be of great interest to any student of species parasitized by the Cowbird. Data are presented which show that Cowbrids are "not specialized for parasitism." Sixty-six successful non-parasitized nests raised an average of 3.4 Song Sparrows, while 28 successful parasitized nests raised an average of 2.4 Song Sparrows. "Hence,

each Cowbird would seem to have been raised at the expense of one Song Sparrow." Cowbird reproduction was slightly less successful, considering the number of eggs laid, than that of the Song Sparrow.

The survival of adult breeding males averaged 60 per cent from one April to the next, while that of adult females was considerably less. Breeding males outnumbered breeding females by 5 per cent to 50 per cent. An average of 12.6 per cent of the fledged nestlings was later found as breeders near the place of their birth. Data would indicate that one-half to three-fifths of those that survive return to the place of their birth. To maintain a stable population, from 15 per cent to 25 per cent (average of 20 per cent) of all fledged young would have to survive to breeding age. It is calculated that the average adult male Song Sparrow lives to be 2 and a half years of age, but several banded individuals reached 7 years. The study indicated that well-situated populations are almost immune to predation and substantiated Errington's principle that survival is "largely determined by the carrying capacity of the land."

Throughout the book the author has demonstrated a remarkable familiarity with the literature pertinent to the problems and thus has been able to make most valuable comparisons with other population studies. The evaluations of the data at hand have been so carefully made that there are few places where contrary conclusions could have been reached. The write-up is a model for clarity. The table of contents and species and subject indices enable one to readily find any topic desired. Although the author had previously published no less than 15 papers on the Song Sparrow study, the majority of the material in this book is new, with previous reports summarized and re-evaluated. The investigation techniques are also reviewed. Particularly to be commended are the concise ways in which quantitative data have been presented in numerous charts, tables and appendices.

Unfortunately the single Song Sparrow color plate loaned for use in the book is quite inferior both as to context and reproduction.—LAWRENCE E. HICKS.

[1] Nice, Margaret Morse. April, 1937. Transactions of the Linnaean Society of New York. Vol. IV. A Population Study of the Song Sparrow. pp. I–VI, 1–247, Charts 18, Tables 33, Maps 14, Appendices 5, one color plate. Price, $1.50.

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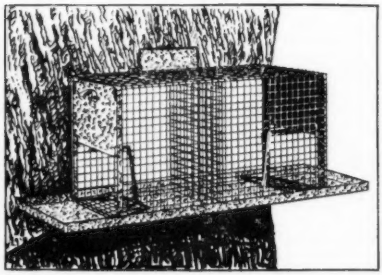

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